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IS 1448-76 (1968): Methods of test for petroleum and its products, Part 76: Density of liquefied petroleum gases [PCD 1: Methods of Measurement and Test for Petroleum, Petroleum Products and Lubricants]

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Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

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IS : 1448 [P : 76] - 1968
Adopted : 22 November 1968
(Reaffirmed 2003)

Indian Standard

METHODS OF TEST FOR PETROLEUM AND ITS PRODUCTS

[P : 76]

DENSITY OF LIQUEFIED PETROLEUM GASES

(Third Reprint DECEMBER 1998)

UDC 662·767:531·758

Adapted from ASTM Designation D 1657-64

1. SCOPE

1.1 This method of test describes a procedure for determining the density at 15°C of liquefied petroleum gases (LPG).

1.1.1 The apparatus prescribed is not to be used for materials having a vapour pressure higher than 14 kg/cm^2 at 15°C (approximately 42 kg/cm^2 at 65°C).

2. OUTLINE OF THE METHOD

2.1 The apparatus is purged by filling and emptying with a portion of the sample before filling with the portion to be used for testing. The pressure cylinder is filled to a level at which the enclosed hydrometer floats freely.

2.2 Samples of LPG are tested by placing the filled hydrometer cylinder in a water-bath maintained at 15°C until the temperature of the contents has reached 15·0° ± 0·2°C.

3. APPARATUS

3.1 Combined Form Glass Thermo-Hydrometer* — The combined form thermo-hydrometer shall conform to the following requirements:

Overall length	354 to 366 mm
Body diameter	19 to 22 mm

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*Till the density thermo-hydrometer meeting the above specification is made available, the thermo-hydrometer for specific gravity conforming to ASTM D 101 H-62 prescribed in ASTM Designation E 100 may be used to determine specific gravity of LPG at 15·6°/15·6°C and then converted to density g/ml at 15°C by using the ASTM-IP Table 21.

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2

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Stem diameter, *Min*	10·5 mm
Nominal density range	0·500 to 0·600 g/ml at 15°C
Scale length	125 to 145 mm
Subdivisions	0·001 mm
Intermediate lines at each	0·005 mm
Numbered at each	0·01 mm
Scale error not to exceed	± 0·001 mm
Thermometer range	1° to 32°C
Thermometer immersion	Total
Thermometer division	0·5°C
Thermometer intermediate lines at each	3°C
Thermometer figured at each	6°C
Thermometer error not to exceed	±0·2°C at 15°C

3.2 Hydrometer Pressure Cylinder — The hydrometer shall be enclosed in a glass or transparent plastic cylinder of polymethylmethacrylate or equivalent material having a wall thickness of approximately 6 mm, a length of 450 mm and of approximately 38 mm ID. The ends shall be tightly sealed by means of suitable gaskets (neoprene rubber or plastic) which are unaffected by contact with hydrocarbons and metal plates as shown in Fig. 1.

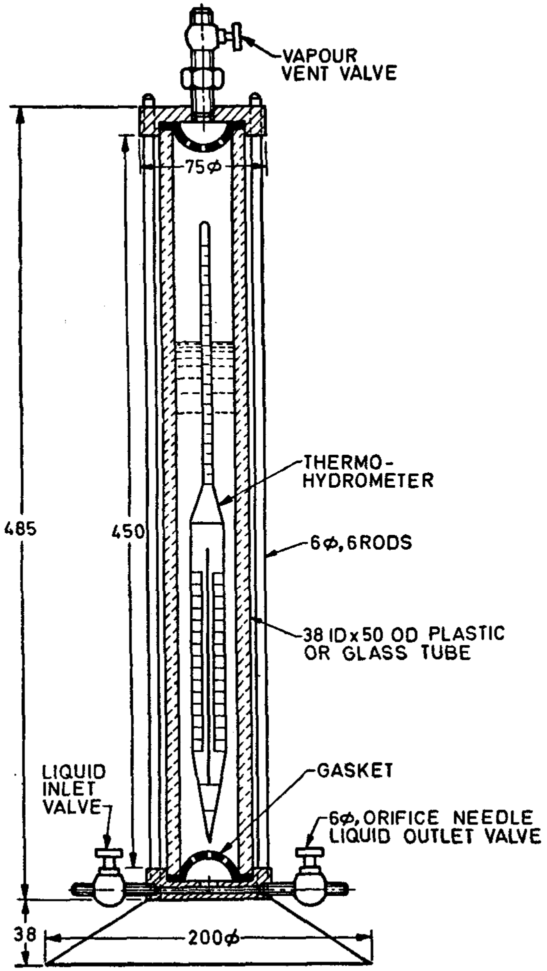
3.2.1 The liquid inlet valve and the liquid outlet valve shall be tightly connected to a base plate which shall be so bored as to give both valves a common inlet to the cylinder. The vapour vent valve shall be similarly connected to the top plate which shall be so bored as to provide a vapour outlet from the hydrometer cylinder. All valves shall be 6 mm needle valves.

3.2.2 As a precautionary measure a protective shield should be placed around the plastic or glass tube.

3.2.3 The working pressure of the cylinder shall not be less than 14 kg/cm^2.

3.2.4 For safety reasons, replace any cylinders that show any fogging, crazing, cracking or etching.

3.2.5 Because certain compounds attack plastics and cloud the inner surface of the cylinder thus making readings of the hydrometer difficult or impossible, users are cautioned to clean the cylinders thoroughly after each use. Ketones and alcohols are most destructive compounds. Some attack is also noted by styrene, toluene, xylene and benzene. Tests show no attack by ethane, ethylene, propane, propylene, butane, iso-butane, normal butylenes, iso-butylene, pentane and iso-pentane. No attack is expected from butadiene and acetaldehyde.



All dimensions in millimetres.

FIG. 1 PRESSURE HYDROMETER CYLINDER

3.3 Water-Bath — The water-bath shall be of such dimensions that the hydrometer cylinder may be completely immersed. Means for maintaining the bath at a constant temperature of 15·0° ± 0·2°C shall be provided.

4. PURGING AND SAMPLING

4.0 Samples for the density determination shall be taken as prescribed in IS : 1447-1966*. To avoid damage to the test equipment and injuries to test personnel, these samples shall not be taken directly into the apparatus from the product source without controlling the inlet pressure to the apparatus where the pressure exceeds the LPG vapour pressure.

4.1 The source of supply of the product to be tested shall be connected to an inlet valve by suitable fittings, so that a representative sample can be introduced into the pressure cylinder. These connections shall be leak-free. Open the outlet valve and purge the sampling connections by opening the inlet valve slightly, permitting the product to flow through the outlet valve at the bottom of the cylinder.

4.2 When the connections have been sufficiently purged, the outlet and vent valves are closed and the inlet valve is opened permitting the liquid to enter the pressure cylinder until it is completely full. If necessary, the vent valve may be opened slightly to permit complete filling of the pressure cylinder and then closed.

4.3 When the pressure cylinder has been filled, close the inlet valve and open the outlet valve, allowing the contents of the cylinder to pass out completely and reducing the cylinder pressure to atmosphere.

4.4 Close the outlet valve and open the inlet valve filling the hydrometer cylinder to a level at which the enclosed hydrometer floats freely. If necessary, to accomplish this filling by venting of the vapour through the vent valves, repeat the purging to cool the cylinder sufficiently to permit its filling without venting.

4.5 With all valves closed, examine the apparatus for leaks. If leaks are present, discard the samples; repair the leaks and repeat the sampling procedure.

5. PROCEDURE

5.1 Disconnect the cylinder and place it in a water-bath maintained approximately at 15°C until the temperature of the contents has reached 15·0° ± 0·2°C as indicated by the self-contained thermometer. In order to accelerate thermal adjustment the hydrometer cylinder shall be lifted, inverted, and again replaced in the right manner in the bath, exercising proper care to prevent damage to the enclosed hydrometer.

5.2 When the product in the pressure cylinder has reached a constant temperature of 15·0° ± 0·2°C, remove the apparatus from the water-bath and observe the gravity at once. Observe and record the hydrometer reading to the nearest 0·001. The hydrometer should not be in contact with the walls of the cylinder while taking a reading. Read and record the temperature to the nearest 0·2°C.

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*Methods of sampling of petroleum and its products.

NOTE — For field density measurements, this method may be used at ambient temperatures; only the accuracy is decreased. Also the observed density shall be reported as corrected to 15°C in accordance with Table 53 of ASTM/IP Petroleum measurement tables.

6. PRECISION

6.1 The results of duplicate tests shall not differ by more than the following amounts:

Repeatability	*Reproducibility*
0·001	0·003

Reprography Unit, BIS, New Delhi, India